TOWARDS A FRAMEWORK FOR MEASURING KNOWLEDGE MANAGEMENT SERVICE PRODUCTIVITY

Research-in-Progress

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Abstract

Knowledge management (KM) is an important strategic support service to obtain a competitive advantage, especially regarding the business processes of services companies. To justify the KM investments sustainability for the organization's competitiveness, KM research focuses on KM success. We categorize the current KM success literature into internal and external success dimensions, and identify a gap in measuring the impact of KM services on business processes. To address the lack of measurement models and indicators, we derive a framework that seeks to measure KM service productivity based on the combination of KM success research and service productivity research. This framework contains a quantitative measurement model for tangible KM factors as well as a qualitative indicator model for intangible KM input and output factors. We propose to evaluate the framework's rigor and relevance to enrich KM success research and to provide practitioners with strategies to measure both tangible and intangible indicators.

Keywords: Knowledge management, knowledge management success, service productivity

Introduction

Over the past 15 years, knowledge and knowledge-based organizational processes' strategic management has been intensively investigated under the KM umbrella (Davenport et al. 1998; Riempp 2004). Therefore, a KM strategy operationalizes strategic knowledge goals related to corporate strategy and recorded at the organizational level (Hansen et al. 1999). In addition to the strategy dimension, holistic KM architectures (e.g., Zack 1999) encompass the technology, culture, and process dimensions. KM processes support the business processes and describe the internal KM knowledge maintenance (Nonaka and Takeuchi 1995). Similar to research services, or the moderation of communities, KM services transfer internal KM process results to the organization's internal customer. KM is therefore a service that addresses the company's business process professionals, and an integral component of other management activities and processes (Fairchild 2002).

Our research is based on the understanding of KM as a service, and our purpose is to present current KM success research (Section 2). The lack of literature on KM service success related to business processes will be addressed by our research question: How does one investigate KM service productivity? In Section 3, we describe a framework to measure KM service productivity that incorporates findings from KM success and service management, and also addresses the lack of service-related KM success literature. We subsequently provide suggestions on how the resulting framework should be evaluated.

Knowledge Management Success

KM has been cited for its potential to create sustainable competitive advantage (Halawi et al. 2005). Nevertheless, Halawi et al. (2005) conclude that empirical and theoretical work in this area is "relatively underdeveloped." Anantatmula and Kanungo (2005) also report that there are no generally accepted KM principles or references that could measure KM-induced improvements in efficiency, effectiveness, and innovation. After conducting a KM success literature review, Kankanhalli and Tan (2005) conclude that KM business metrics' measurement is difficult due knowledge assets' intangible nature and the "relative infancy of research on KM metrics."

Most KM success models are based on information systems research and therefore take the KM system dimension into consideration (Halawi et al. 2007; Jennex and Olfman 2006; Tanriverdi 2005). By taking a more holistic KM perspective, which also incorporates systems, it is possible to identify four dimensions of analysis that follow Lee and Choi's (2003) KM research framework (see Figure 1).

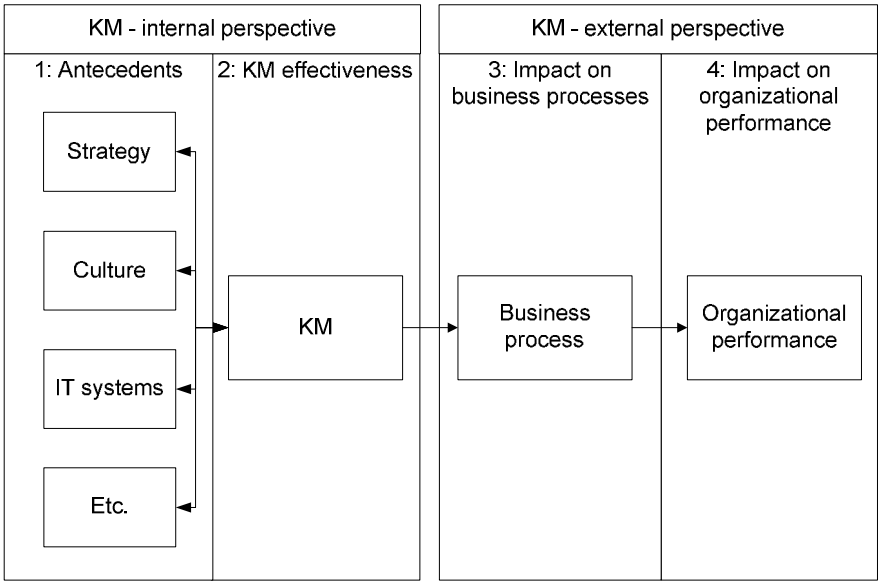

Figure 1. KM Success Research Dimensions Based on Lee and Choi (2003)

KM success studies address at least one of these dimensions; most also describe the relationships between these dimensions. It has therefore been established that the relationships between the dimensions are unidirectional; the exception is the antecedent dimension, which KM again influences. Studies of the first dimension – the antecedents – describe the organizational prerequisites or antecedents that are given or can be developed to successfully support KM. This allows readiness for KM to be evaluated. The second dimension describes KM's effectiveness. Here, the current KM status is compared to an externally or internally given benchmark. While the first and second dimensions concentrate on the KM internal perspective, the third – its impact on the business processes – and fourth – its impact on the organizational performance – relate to the KM output. The tangible impact on the business processes is measured by quality or productivity measures. The fourth dimension seeks to measure KM's impact on the organization performance. Table 1 shows the classification of the relevant KM success studies.

Table 1. KM Success Dimensions Addressed by KM Success Literature

Author(s)	Antecedents	KM effectiveness	Impact on business processes	Impact on organizational performance
Anantatmula and Kanungo 2005			X	
Barcelo-Valenzuela et al. 2008	X	X		
Davenport et al. 1998	X			
Edgington and Chen 2002			X	X
Edvinsson and Malone 1997	X			
Freeze and Kulkarni 2008	X	X		
Gold et al. 2001	X			X
Halawi et al. 2007			X	
Holsapple and Wu 2008		X		X
Holt et al. 2007	X			
Khalifa et al. 2001	X	X		
King and Ko 2001			X	X
Lee and Choi 2003	X		X	X
Massey et al. 2002	X	X		
McKeen et al. 2006		X		X
Mohammadi et al. 2009	X			
Rhoads et al. 2007	X	X		
Roos et al. 1998	X			
Sveiby 1997	X			

Existing KM success research is focused on the antecedents and KM effectiveness, which allows for the description of the success factors and provides the reasons for well-functioning KM. However, only a few authors address KM output. If one regards KM as a service that supports business processes, its impact on organizational performance can only be partially traced back to KM, since support processes do not directly generate externally sold products. Since the third dimension focuses on KM's direct impact on business processes, it is the most promising dimension. Although four studies have examined this dimension, none of them have explicitly focused on KM services: They only discuss the intermediate KM benefits, for example, improved employee skills (Anantatmula 2005), organizational behaviors and decisions' greater impact (King and Ko 2001), and organizational creativity (Lee and Choi 2003); none of these relate to specific services. Nonetheless, these studies propose critical success factors and indicators for KM success measurement which can be incorporated into a KM service productivity measurement framework. Table 2 shows selected critical success factors, indicators, as well as applied data collection methods.

Table 2. Selected Critical Success Factors, Indicators, and Data Collection Methods

	Critical success factor	Indicator	Data collection method
1: Antecedents			
Tanriverdi 2005	KM capability	Extent to which firms create, transfer, integrate, and leverage related product, customer and managerial knowledge resources across business units	One Likert-scale based question
Lee/Choi 2003	Centralization vs. decentralization	Centralization	Five Likert-scale based questions
Lee/Choi 2003	Centralization vs. decentralization	Formalization	Four Likert-scale based questions
Lee/Choi 2003	Openness and trust	Trust	Four Likert-scale based questions
Lee/Choi 2003	Willingness for learning	Learning	Three Likert-scale based questions
Lee/Choi 2003	Willingness for learning	T-shaped skills	Four Likert-scale based questions
2: KM effectiveness			
Halawi et al. 2007	Knowledge quality	Knowledge quality	Nine Likert-scale based questions
Halawi et al. 2007	Service quality	Service quality	13 Likert-scale based questions
Halawi et al. 2007	System quality	System quality	Eleven Likert-scale based questions
3: Impact on business processes			
Anantatmula and Kanungo 2005	Improved communication	Improved communication	n/a
Anantatmula and Kanungo 2005	Enhanced collaboration	Enhanced collaboration	n/a
Lee/Choi 2003	Enhanced collaboration	Collaboration	Four Likert-scale based questions
Anantatmula and Kanungo 2005	Better decision making/innovativeness	Better decision making	n/a
Muhamed et al. 2009	Better decision making/innovativeness	Innovation	Three Likert-scale based questions
Lee/Choi 2003	Better decision making/innovativeness	Organizational creativity	Five Likert-scale based questions
Lai 2009	User satisfaction	User satisfaction	Two Likert-scale based question
Anantatmula and Kanungo 2005	Improved employee skills	Improved employee skills	n/a
Anantatmula and Kanungo 2005	Quality	Enhanced quality	n/a
Muhamed et al. 2009	Individual productivity	Employee's performance	Three Likert-scale based questions
4: Impact on organizational performance			
Lee/Choi 2003	Organizational performance	Comparison with key competitors	Four Likert-scale based questions

Our research seeks to address this gap in KM success literature by developing a framework that describes KM services' impact on business processes. We thus identify the implications of measuring KM service productivity from service characteristics, and identify measurement indicators.

Towards a KM Service Productivity Measurement Framework

To enhance KM success research, KM's service idea must be taken seriously. This implies that service-level agreements can represent the scope definitions of explicit KM activities. Thus, KM's visibility and tangibility can become clearer for customers and stakeholders. The customization of KM also allows for identifying business process operators as a target group. This allows KM output information, which is useful for a measurement framework, to be gathered in a more focused way.

This general framework seeks to investigate KM service productivity. Johnston and Jones (2004) maintain that "productivity is the ratio of what is produced by an operation of process to what is required

to produce it, or put simply the ratio of actual output to input over a period of time." Consequently, the output-input ratio is evaluated to assess a KM investment's sustainability and to further develop KM services. KM service characteristics have important implications for the development of such a framework:

- Equal measuring units must be compared to obtain a productivity ratio. Depending on the chosen indicators, different ratios can be generated. This is particularly important if intangible qualitative indicators (e.g., higher customer satisfaction and quality improvement) are compared with financial tangible indicators (e.g., revenue, profit, and value added) (Fitzgerald et al. 1991). Furthermore, the productivity ratio itself is not informative unless it is compared to previous periods or benchmarked (Johnston and Jones 2004).
- Services consists of tangible and intangible input and output factors (Zeithaml et al. 1985). Intangible factors in KM services must be specifically considered. Consequently, the final framework must comprise intangible input and output factors, in addition to the productivity value representing the tangible factors.
- Furthermore, service productivity is categorized into operational and customer productivity (Johnston and Jones 2004). Operational productivity is described by KM effectiveness research, while customer productivity enhances the financial perspective with subjective factors like perceived value (Parasuraman 2002).

It is easy to identify tangible input factors for KM services. The labor costs and time used to complete a task can be relevant input factors. It should be noted, however, that owing to their internal support functions, most KM services do not have a fixed charge rate. If the costs are based on the share of the costs, indicators must be identified that can prove the services' benefits to customers. Based on the literature described in Section 2, we identify criteria and indicators for measuring KM success. We differentiate between tangible and intangible input and output factors to assign the indicators to KM services. The resulting framework is shown in Figure 2.

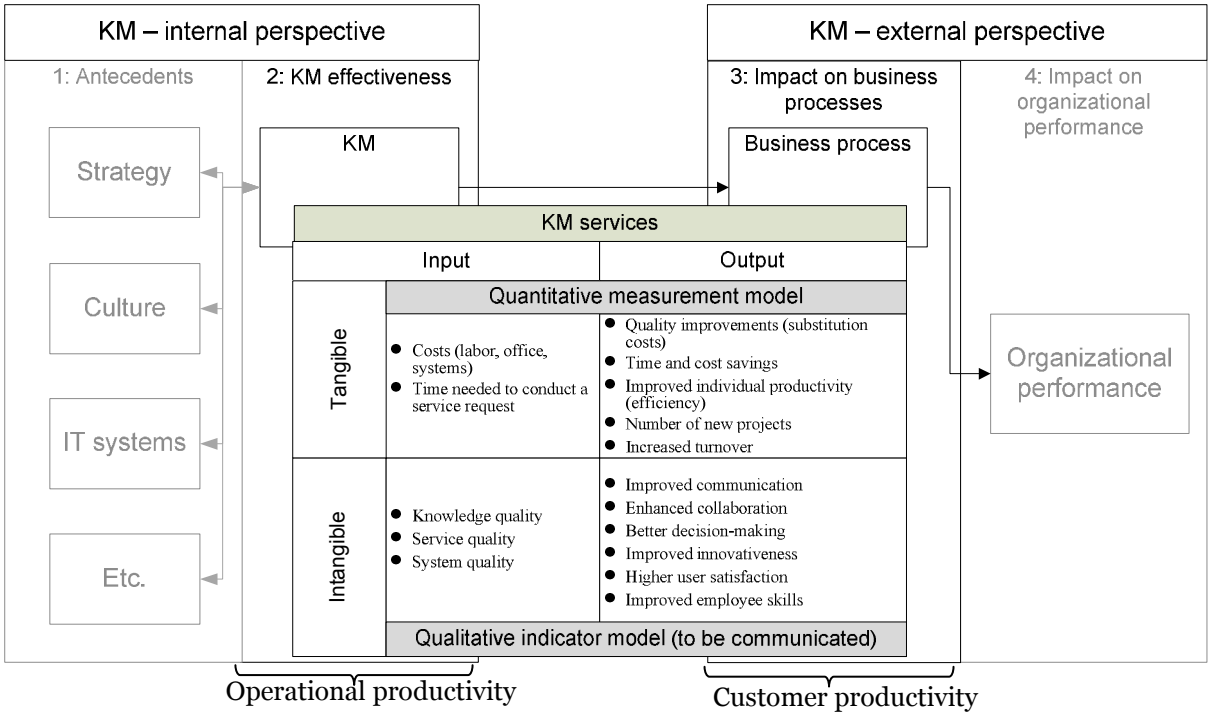

Figure 2. KM Service Productivity Measurement Framework

The framework incorporates a quantitative measurement model that covers tangible KM service inputs and outputs. Frequently mentioned indicators are: quality improvements (Anantatmula 2005), time and cost savings (Muhammed et al. 2009), and improved individual productivity (Jennex 2008). The indicators listed in Table 2 are already a useful indication of potential categories for a quantitative

measurement model. However, these indicators have to be operationalized to be measurable, e.g. through Likert-scale based questions.

The measurement of quality improvements can be undertaken through personal feedback or questionnaires. Thereby, project members have to estimate the percentage of quality improvement that can be credited to the use of KM services. This allows the number of new projects to be converted into monetary terms. Where comparable processes are available to serve as benchmarks, time and cost savings can be measured on a case by case basis. The timeliness of completed assignments, the number of completed assignments, the completeness of solutions, the quality of solutions (well written with complete documentation), the newly solved problems, the amount of work that has to be repeated, and the amount of backlog can be indicators to measure individual productivity (Jennex 2008). Considering the input, the factor costs and time needed to complete a service request can be applied.

The following services could be relevant if KM is considered a service: inquiry management by means of knowledge research, business process support (e.g., through debriefings), the provision and maintenance of tools (e.g., KM systems, CoPs), knowledge and competence gap identification, and overarching (proactive) synergy creation. These services can be assessed by the criteria mentioned above: quality improvements, time and cost saving, and innovativeness.

The KM services' users can be asked to reveal their assessments, for example: How much time do you save through the use of KM systems? The results will reveal the output factor if converted to personnel costs. On the other hand, the output factor can be divided by the input costs (service fees or personnel costs). Table 3 presents potential criteria for measuring KM services' productivity.

Table 3. Potential Measurement Criteria for KM Services' Productivity

KM Service	Criterion 1	Criterion 2	Criterion 3
Inquiry management through knowledge research	Quality improvement	Personal costs	More products
Business process support	More projects; quality improvement	Time saving	New products, innovative projects
Provision and maintenance of tools (e.g. KM systems, CoPs)	Increased usage; increased satisfaction	Decreased searching time	New communities
Knowledge and competence gap identification	Support of strategic goals	Avoidance of missing trends	Support of HR and knowledge planning
Overarching (proactive) synergy creation	Higher satisfaction with the corporate culture	Avoidance of duplications	New products, new contacts

The financial values can therefore cover the ratio. A simple ratio can be, for example, the time saved through KM by using knowledge research services in relation to researchers' working hours. An enhanced ratio also includes the profit made through newly developed products.

Furthermore, intangible factors that can only be measured qualitatively must also be considered. Thus, the improvement in communication (Anantatmula 2005) that is associated with enhancement collaboration (Lee and Choi 2003) can only be measured through employee surveys. Lee and Choi (2003) mention the following factors: the oorganization members' satisfaction with the degree of collaboration, the organization members' supportiveness, the organization members' helpfulness, and the cross-organizational units' willingness to collaborate within the organization.

Other output factors consider improved decision-making (Lee and Choi 2003), improved innovativeness (Khalifa et al. 2008), increased user satisfaction (Lai 2009), and the improvement in employee skills

(Anantatmula 2005). Halawi et al. (2007) consider knowledge quality, service quality, and system quality to be relevant input factors.

Owing to the need for quantitative measurement indicators, intangible input and output factors cannot form part of the financial values' productivity ratio. Nevertheless, continuously communicating the influencing factors and long-term results, which is associated with KM service productivity measurement, is very important for the framework. This allows management understanding of, attention to, and support for the intangible and indirect KM benefits to be established. An attitude change can then be initiated that will enable any KM initiative to shift its efforts from short-term and measurable undertakings to long-term projects.

Consequently, a qualitative indicator model is needed that complements the quantitative measurement model by communicating the intangible inputs and outputs of KM services. It should be noted that there is a feedback loop between intangible input and output factors. Thus, communication and collaboration that have been enhanced in the long term improve knowledge quality, which is an important input factor. Storytelling is an established way of communicating intangible KM outputs (Perret et al. 2004). The communication of both short-term tangible results and long-term relationships between such intangibles is an important contribution to KM success research.

Implications and Next Steps

The framework we developed must be evaluated, modified, and refined. Qualitative interviews will be conducted with Chief Knowledge Officers (CKOs) from professional services firms (PSF) to evaluate the scope of their potential KM services and indicators. The PSF branch has been chosen because consultancy and auditing companies' work is highly knowledge-oriented and these companies are early KM adopters. Such firms therefore need to invest in KM, whose benefits must be confirmed through measurements. In addition, these companies' managements have a high level of awareness of intangible factors' importance. When, for example, industry enterprises adopt the KM service productivity measurement framework, they should take into account that KM is less a part of the daily business. Accordingly, an appropriate qualitative indictor model has to be developed to ensure that more than just the quantitative values are identified and, ultimately, also communicated.

We will continue our research in the context of a KM benchmarking study (reference blinded for the review process), holistically querying all KM dimensions by means of a questionnaire. We are undertaking this research for the fifth year now. The advantage of the panel is the high degree of trust among the participants. The findings are therefore discussed and evaluated at topic-related workshops. In addition, data gathering workshops and results workshops are conducted at which the individual results can be discussed with the company representatives.

Furthermore, methods to gather indicators and to communicate KM services outputs will be identified. The resulting collection of methods for gathering and communicating KM services productivity can be assigned to the framework, taking the context (antecedents) into consideration. The results will be further evaluated by conducting multiple case studies. The case study approach has been chosen, as case research is useful when a phenomenon is broad and complex, when the current body of knowledge is not sufficient to permit the formulation of causal questions, when a holistic, in-depth investigation is required, and when it is impossible to study a phenomenon outside the context in which it occurs (Benbasat et al. 1987; Bonoma 1985; Feagin et al. 1991). Furthermore, the purpose traditionally pursued by case studies is the generation of theories or models for later testing (Lee 1989), which is in line with our research aim.

The case study approach that will be applied consists of three steps. Questions concerning the KM service productivity measurement framework will be integrated into the questionnaire, which will be distributed on a yearly basis. The questions request quantitative values and qualitative or subjective results. In addition, in-depth interviews will be conducted at workshops to enrich the data gathered. After the data evaluation and presentation, the results will be discussed within the panel. Here, the feedback on the questions and the underlying models will be obtained and incorporated.

The research allows the influence of the KM success dimensions *antecedents* and *impact on organizational performance* in the framework to be integrated to yield a holistic view of KM success by

considering the relationship between the dimensions described in figure 1. Consequently, the framework links the dimensions and KM success research's perspectives.

This study has implications for theory and practice. It enriches research on KM and KM success by considering KM as a service that allows for the identification of customers and the scoping of the services themselves. Furthermore, this study combines intangible and tangible indicators for measuring KM success by combining quantitative measurement and qualitative indicators. After evaluating the framework, a holistic view of KM success – including interdependencies between the different dimensions – can be established. Finally, this study will provide practitioners with guidelines on how to measure and communicate the KM services productivity, as well as KM success.

Conclusion

Research on KM success is widely dispersed and partially based on divergent definitions. Based on Lee and Choi's framework, we developed a new research framework for KM success that contains the internal and the external perspectives on KM. We also consider KM a service offering to make KM outputs more definable.

By combining the research framework with the service concept, we aim to address KM service productivity to unite the internal and external perspectives on KM. The method for measuring KM service productivity contains a quantitative measurement model to quantify tangible KM inputs and outputs. Furthermore, the method considers intangible KM input and output factors that often complicate the KM success measurement. Thus, a qualitative indicator model has to be developed to communicate long-term and indirect KM outcomes.

After the initial framework definition, we will validate and modify it in terms of empirical research. For this, we will use a KM benchmarking panel that allows us to gather intangible factors due to the high level of trust among the participants. We expect results that allow us to establish a relationship between the framework's dimensions and to develop a qualitative indicator model that can be adjusted to the KM initiatives' maturity levels to very specifically communicate the KM's benefits.

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